

What is Claimed is:

1. A catalytic exhaust gas decomposition apparatus, comprising:

a spiral flow generator for forming a spiral flow of an exhaust gas containing therein a substance to be decomposed and a reactant gas;

a flow rectifier for rectifying the spiral flow formed by said spiral flow generator; and

a catalyst bed for letting the substance to be decomposed contained in said exhaust gas react with said reactant gas after the spiral flow has been rectified by said flow rectifier;

wherein said flow rectifier is a plate-like baffle wall having therein a through hole at a portion near the center thereof, and the spiral flow generated by said spiral flow generator is concentrated at the through hole, and then passed through the through hole and an enlarged section of a flow path downstream of the through hole before being introduced into said catalyst bed.

2. The catalytic exhaust gas decomposition apparatus according to claim 1, wherein a heating furnace is provided to the outside of said spiral flow generator.

3. The catalytic exhaust gas decomposition apparatus according to claim 1, wherein said spiral flow generator,

said flow rectifier, and said catalyst bed are housed in the inside of a cylindrical reaction tower.

4. The catalytic exhaust gas decomposition apparatus according to claim 3, wherein a heating furnace is provided around said reaction tower.

5. The catalytic exhaust gas decomposition apparatus according to claim 3, wherein said spiral flow generator, said flow rectifier, and said catalyst bed are housed in the inside of said reaction tower in that order from a top portion thereof downward.

6. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein an inner cylinder is provided at an upper portion inside said reaction tower, and said exhaust gas and said reactant gas flow through a space defined by said inner cylinder and an inner wall of said reaction tower along an outer periphery of said inner cylinder to form the spiral flow.

7. The catalytic exhaust gas decomposition apparatus according to claim 6, wherein an entrance port for said exhaust gas and said reactant gas is provided in a side wall at an upper portion of said reaction tower, said entrance port being disposed substantially horizontally and slantwise with respect to the side wall of said reaction tower, thereby allowing gases introduced through said entrance port into said reaction tower to spiral along the

outer periphery of said inner cylinder.

8. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein a clearance is provided between the inner wall of said reaction tower and an outer surface of said baffle wall, and said exhaust gas and said reactant gas flow through said clearance to a downstream side in said reaction tower.

9. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein said catalyst bed is sandwiched between an upper porous plate and a lower porous plate, and a woven fabric or a non-woven fabric is placed between said upper porous plate and said catalyst bed.

10. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein said catalyst bed is sandwiched between an upper porous plate and a lower porous plate, and a mesh plate having a smaller hole diameter than said upper porous plate is placed between said upper porous plate and said catalyst bed.

11. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein a ring-shaped member is provided on an inner wall surface of said reaction tower below said catalyst bed to prevent gases flowing through the inside of said catalyst bed from flowing downwardly along the inner wall surface of said reaction tower.

12. The catalytic exhaust gas decomposition apparatus according to claim 5, wherein a ring-shaped member is provided on an inner wall surface of said reaction tower at a position, at which said catalyst bed is disposed, to prevent gases flowing through said catalyst bed from flowing downwardly along the inner wall surface of said reaction tower.

13. The catalytic exhaust gas decomposition apparatus according to claim 12, wherein a plurality of said ring-shaped members are provided in the inside of said catalyst bed.

14. The catalytic exhaust gas decomposition apparatus according to claim 9, wherein said catalyst bed, said upper porous plate, said lower porous plate, and said woven or non-woven fabric are available as a set and said set is replaceable.

15. A catalytic exhaust gas decomposition apparatus for decomposing PFC, comprising:

a first scrubber for making an exhaust gas containing therein PFC as a substance to be decomposed in contact with an alkaline aqueous solution to remove gaseous impurities contained in said exhaust gas;

a second scrubber for removing solid substances contained in the exhaust gas processed by said first scrubber;

a water adding device and an air adding device for adding water and air, respectively, to the exhaust gas processed by said second scrubber;

a preheater for preheating the exhaust gas to which the water and air have been added;

a reaction tower of an external heating type that introduces the exhaust gas preheated by said preheater to decompose the exhaust gas by letting PFC react with water and air;

a cooler for cooling with water the gas processed by said reaction tower; and

an exhaust gas cleaning tower for removing acid components included in the gas cooled by said cooler by cleaning the gas with water or alkaline aqueous solution;

wherein said reaction tower is provided therein with a spiral flow generator, a baffle wall, and a catalyst bed, placed in that order from a top portion thereof downward; said baffle wall has therein a through hole at a portion near the center thereof; and the gas introduced to said reaction tower forms a spiral flow by functioning of said spiral flow generator, is passed through the through hole in said baffle wall and an enlarged section of a flow path downstream of the through hole, and is introduced into said catalyst bed.

#### 16. The catalytic exhaust gas decomposition

apparatus for decomposing PFC according to claim 15, wherein a clearance is provided between an inner wall of said reaction tower and an outer surface of said baffle wall, and a gas in said reaction tower flows through said clearance to a downstream side in said reaction tower.

17. The catalytic exhaust gas decomposition apparatus for decomposing PFC according to claim 15, wherein said catalyst bed is sandwiched between an upper porous plate and a lower porous plate, and a fabric member is placed between said upper porous plate and said catalyst bed.

18. The catalytic exhaust gas decomposition apparatus for decomposing PFC according to claim 15, wherein a ring-shaped member is provided on an inner wall surface of said reaction tower at least at either a position, at which said catalyst bed is disposed, or a position lower in level than said catalyst bed, to prevent gases flowing through said catalyst bed from flowing downwardly along the inner wall surface of said reaction tower.

19. An exhaust gas decomposition method, comprising the steps of:

forming a spiral flow of an exhaust gas containing therein a substance to be decomposed and a reactant gas; rectifying said spiral flow; and

introducing said spiral flow to a catalyst bed to allow said substance to be decomposed to react with said reactant gas;

wherein said spiral flow is passed through a through hole provided at a portion near the center of a baffle wall, and then passed through an enlarged section of a flow path downstream of the through hole before being introduced into said catalyst bed.